

advanced
clean production

acp

Cleaning and Micro deburring with „quattroClean“: dry, automated, one-piece-flow



acp systems AG

founded 1997

Employees 90

Core Competence:

CO₂-Snow-Cleaning and Automation

From process technology to complete customized cleaning machine

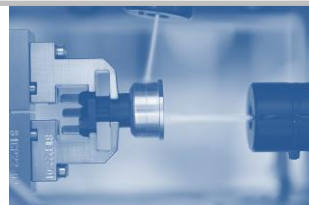
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Contact: hans-joerg.woessner@acp-systems.com / www.acp-systems.com

HQ and Automation Zimmern ob Rottweil



CO2 Technology Site Ditzingen



CO₂ Jet assembly and principal functionality of the acp-nozzle[©] system

Core-jet

CO₂ - snow

Jacketed jet

compressed air or N₂

1 – 16 bar

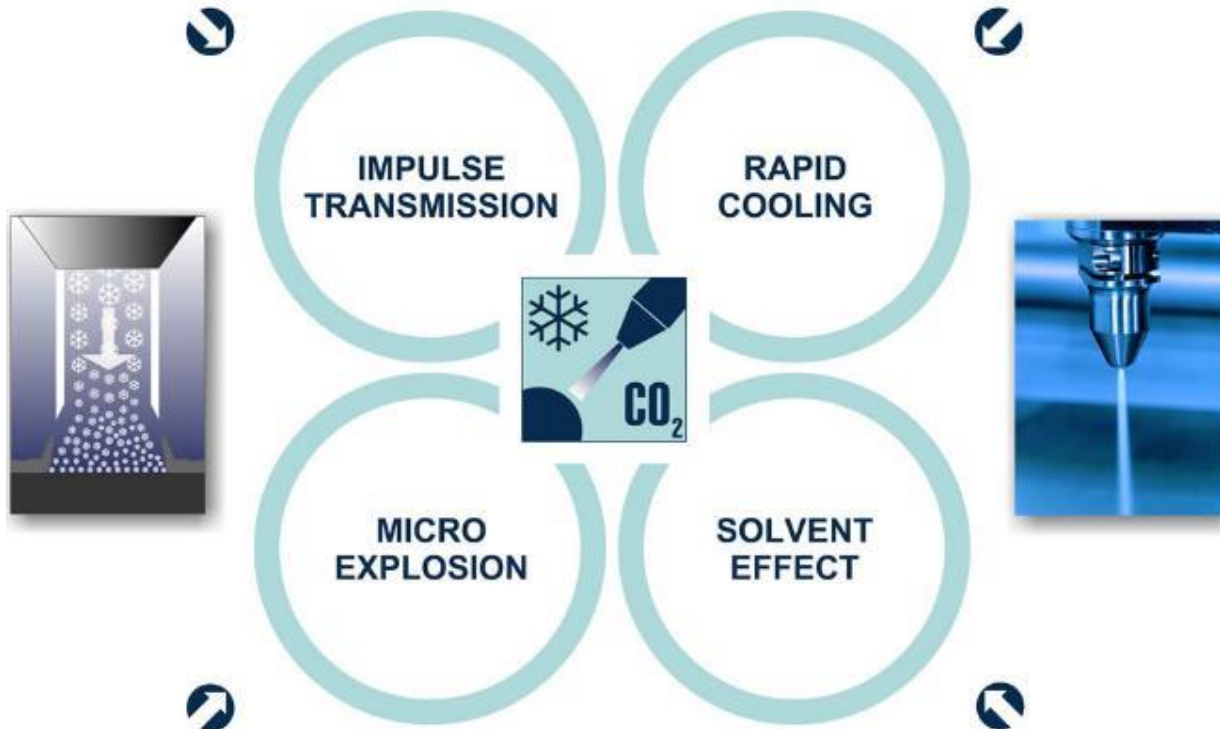
approx. 500 m/sec



acp systems AG quattroClean™ technology

Impulse transmission due to accelerated snow crystals (micro-blasting effect)

Thermal strains due to rapid cooling (temperature gradient)



Sublimation: rinsing due to the increase in volume of approx. 600x

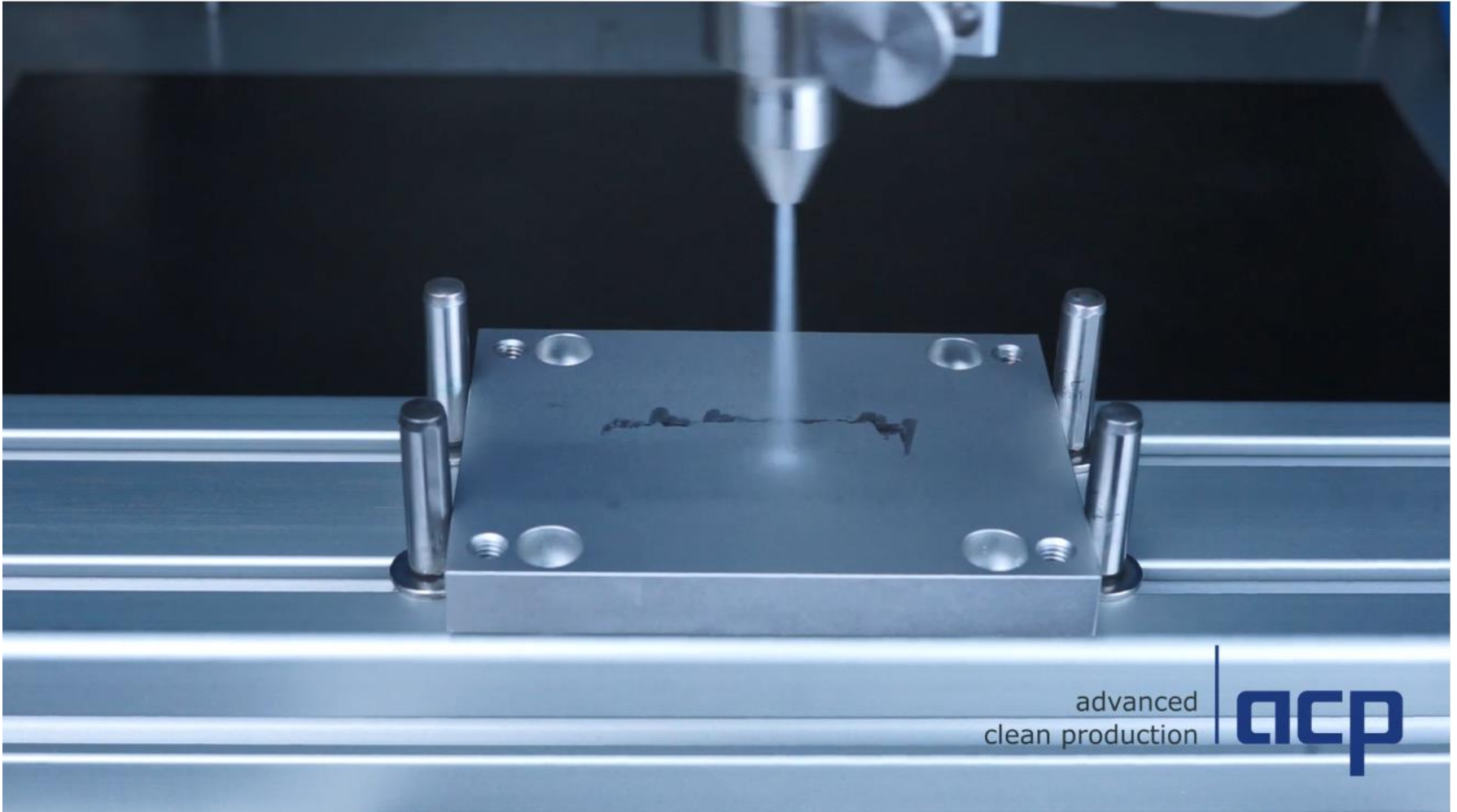
Solvent effect: the dissolving potential of supercritical CO_2 is comparable with cyclohexane (C_6H_{12})

(patented two component acp-nozzle®)

quattroClean Technology

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acp systems AG quattroClean™ technology



- **Features:**

- **Cleaning process:**

- Very gentle CO₂ snow blasting process due to patented acp nozzle technology
- Ideal also for sensitive and finely structured surfaces

- **Cleaning medium:**

- Environmentally friendly and completely non-toxic
- Solvent-free

- **Drying process:**

- not necessary
- 100% residue-free

- **Easy handling due to the supply of liquid CO₂**

- The cleaning medium is readily available and can also be stored indefinitely.

- **Proven technology for automation solutions**

- The cleaning process can be started and stopped in seconds and thus very short cycle times can be achieved.

- **Application fields**

The quattroClean process complements/replaces traditional wet-chemical cleaning solutions and is used worldwide from manual to fully automatic cleaning in series production for a wide variety of cleaning tasks, e.g. in

- Automotive
- Micro- and precision mechanics
- Electronics
- Electromobility
- Lightweight engineering
- Medical technology
- Additive manufacturing

quattroClean: up to automated solutions

Standard Products

JetWorker™

- Portable
- Integrated CO₂ bottle
- R&D
- Buy or rent



JetStation™ (manual)

- Glove box
- Mini-environment
- Stainless Steel
- R&D
- Manual production



JetStation™ (automated)

- Door or Conveyor
- Automated production
- Mini-environment
- Stainless Steel



JetModule™

- Fully automated inline process module
- For system integration
- Multi-nozzle applications
- Process monitoring
- Min Maintenance



- **Application fields**

- 1. Micro Deburring and Cleaning: CO₂-snow technology**

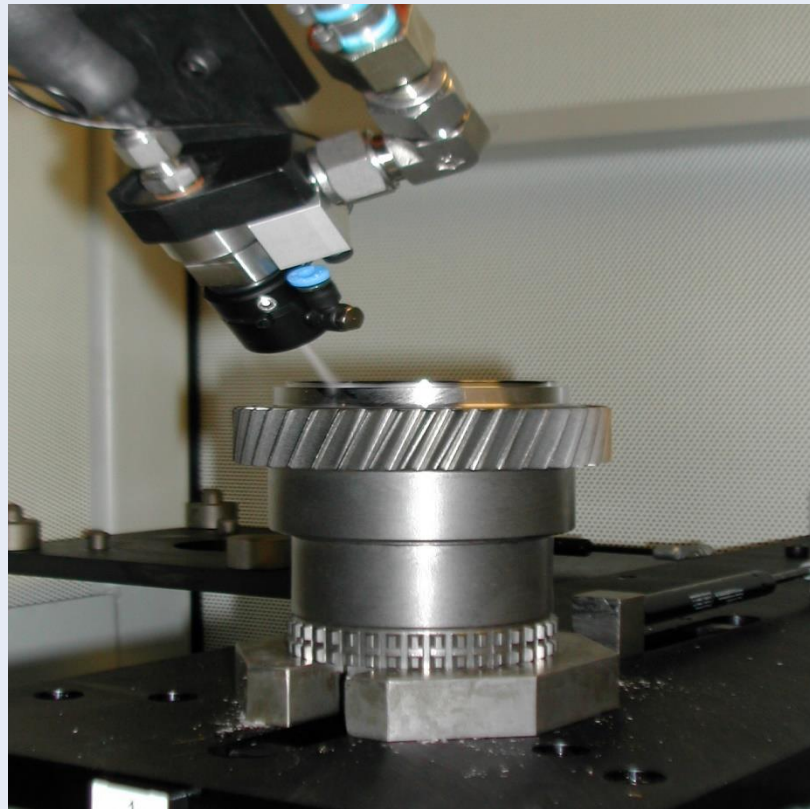
- 2. Deburring and Cleaning: CO₂-power snow technology**

First application field with examples:

1. **Micro Deburring and Cleaning: CO2-snow technology**

- **Cleaning before laser welding**

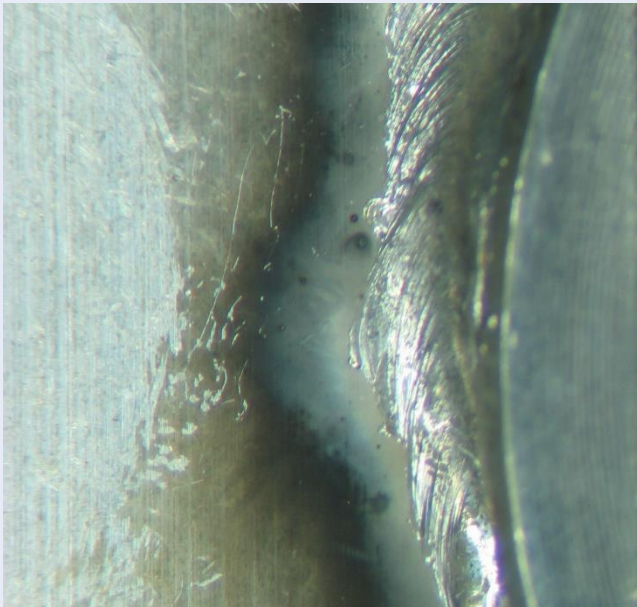
Example: cleaning gear components



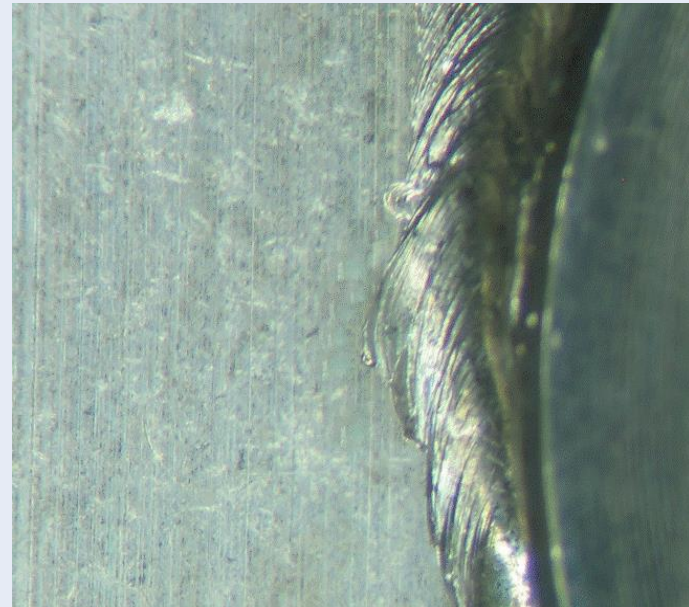
- **Cleaning after laser welding**

Example: cleaning precision mechanic component

before cleaning

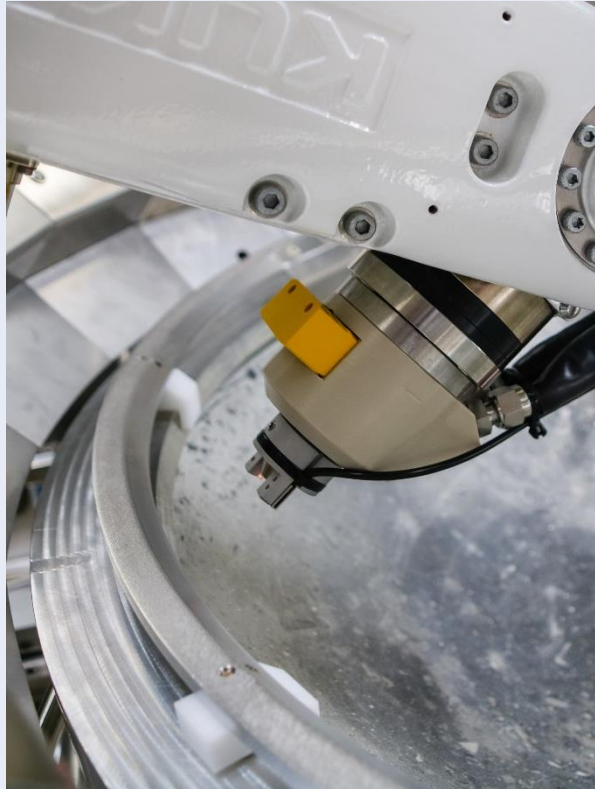


after cleaning



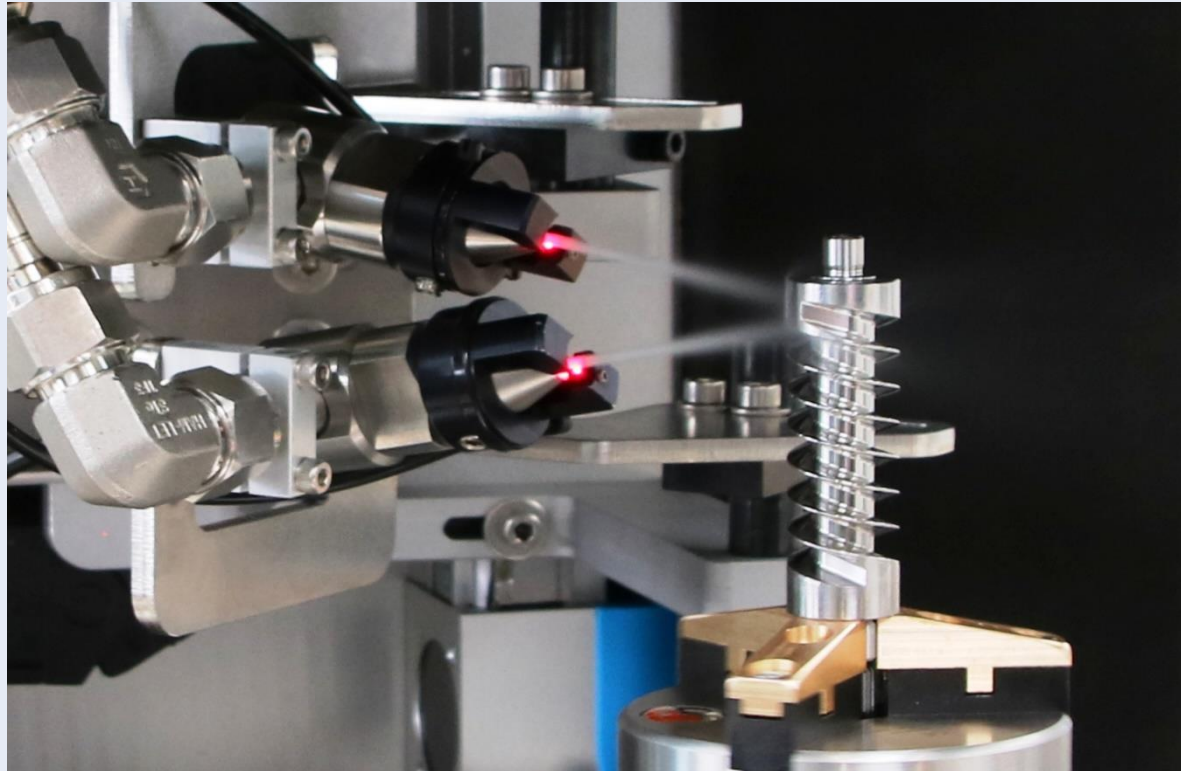
- **Cleaning before coating**

Example: cleaning of steel components before coating



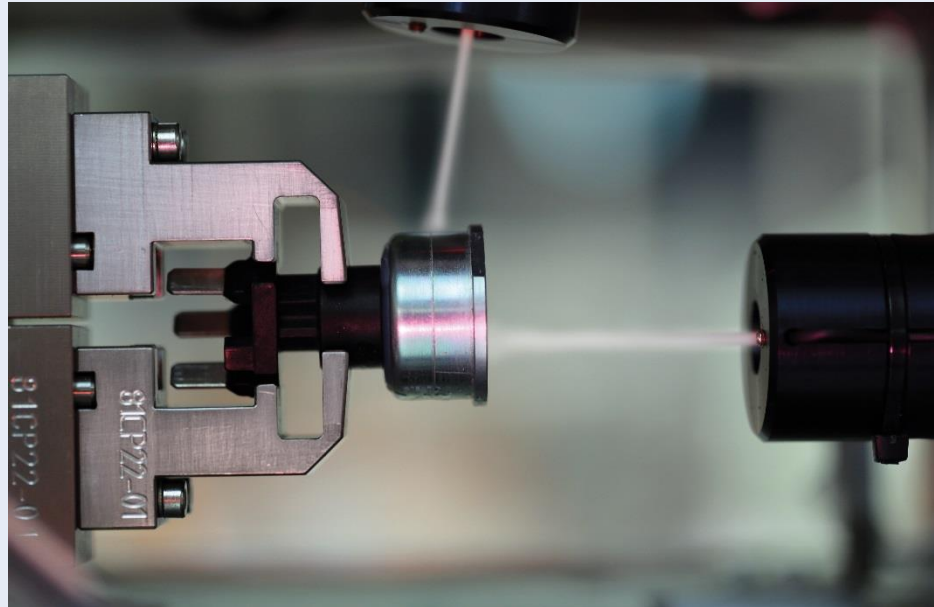
- **Cleaning before optical measuring 0,002 mm on the surface**

Example: cleaning of steel component after machining



- **Cleaning a pressure sensor, inside blinded hole and outside**

Automated cleaning machine, serial production in different countries



- **Cleaning very sensitive electronic component to avoid short circuit**

take away ablation residues on top layer with thickness 0,003 mm after laser processing

before cleaning



after cleaning



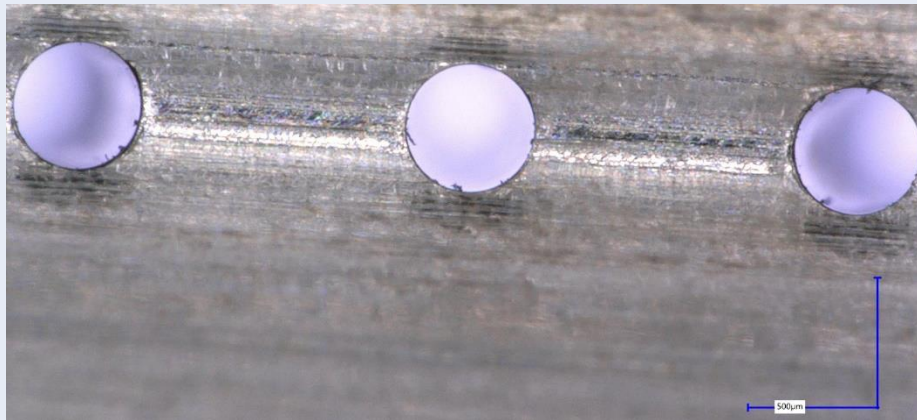
- Cleaning before dosing of liquid seal

Housing for electronics

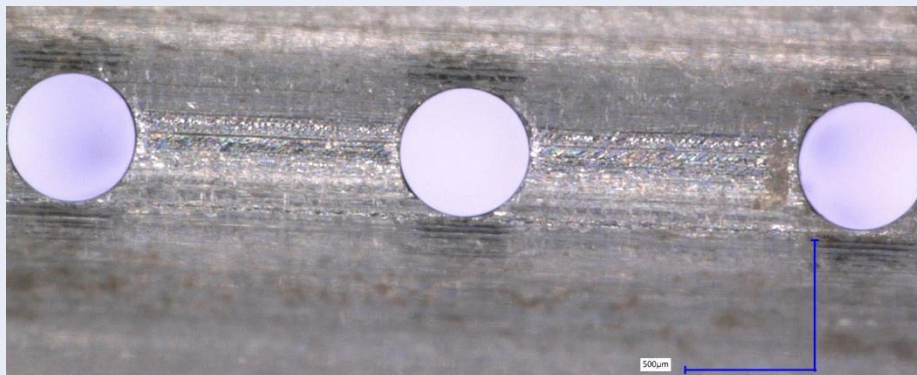


- **Cleaning and micro deburring after grinding**

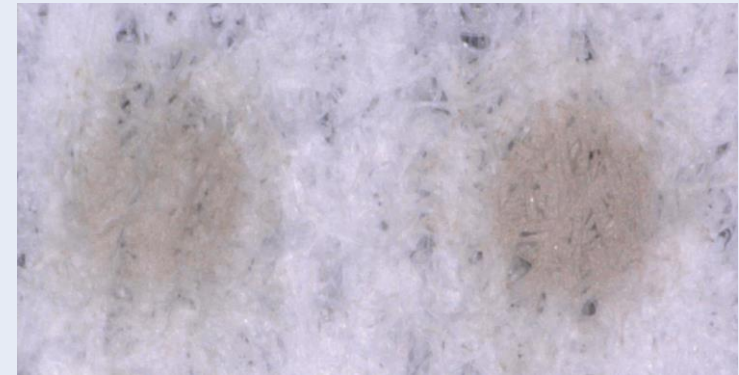
Example: cleaning gear components, hole diameter 0,5 mm.



before cleaning



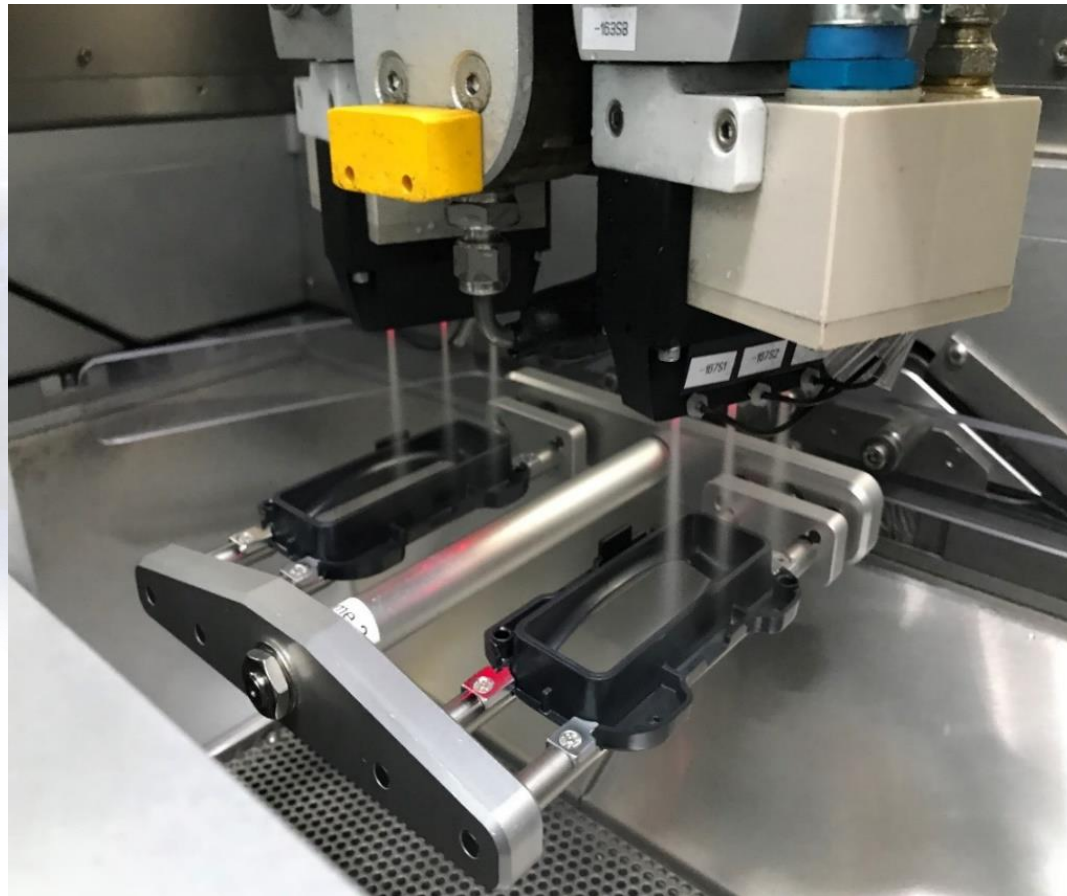
**particles taken away
after cleaning**



quattroClean – Technology

Example: cleaning and micro-deburring of thermoplast parts

Fully automated removal of micro burrs and residues, machine made by acp systems



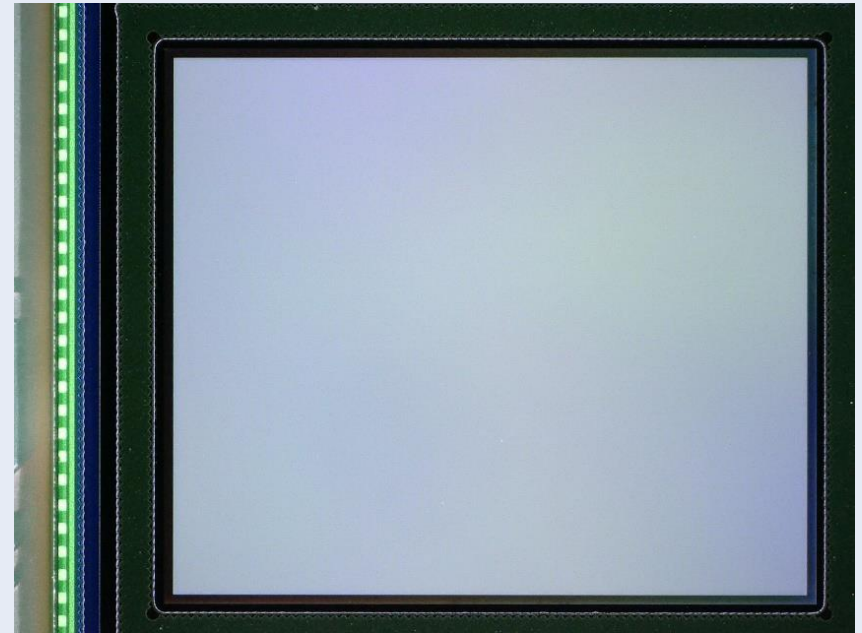
Application example: removing organic residues and micro-particles

Imager of automotive back drive camera

Before cleaning



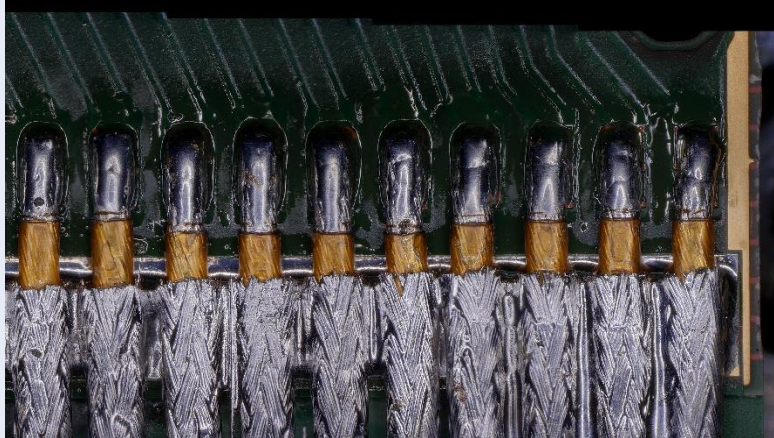
After cleaning



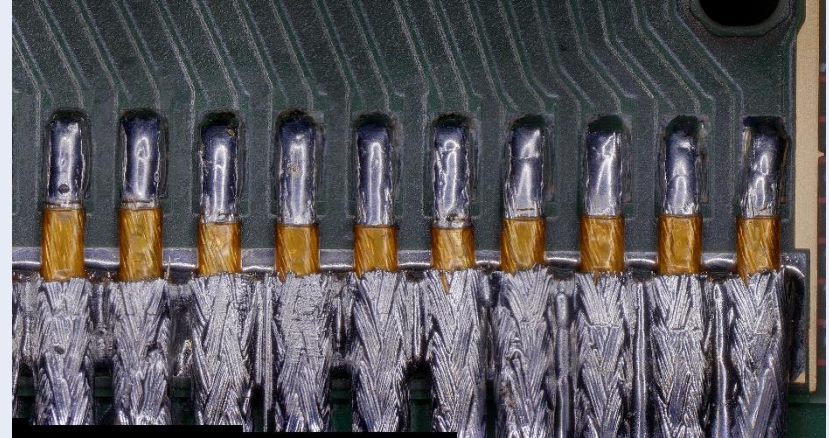
Application example: removing of flux after soldering

Printed circuit board (PCB) after soldering

Before cleaning



After cleaning



Application example: removing of flux and soldering beads

Printed circuit board (PCB) after soldering

Before cleaning



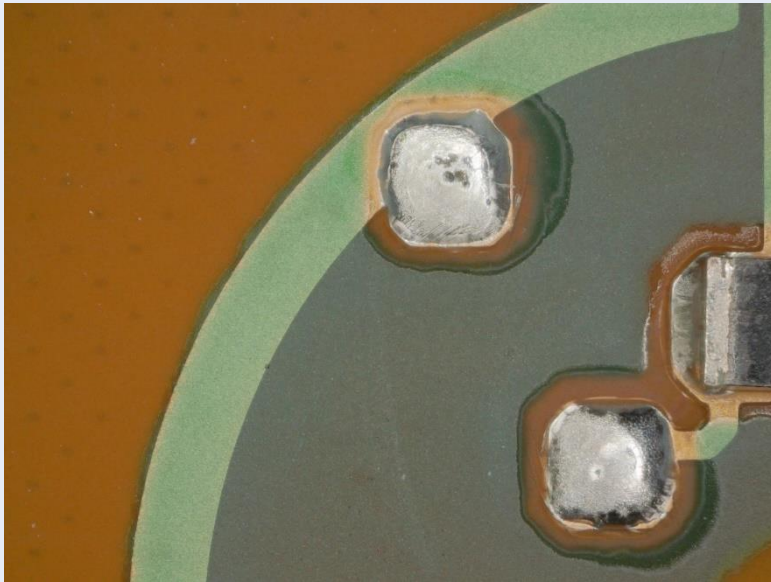
After cleaning



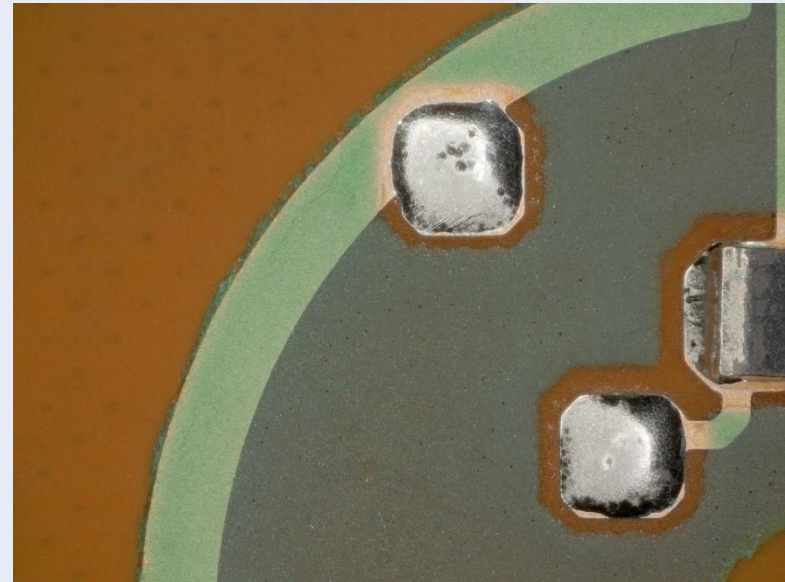
Application example: removing of flux after soldering

Printed circuit board (PCB) after soldering

Before cleaning



After cleaning



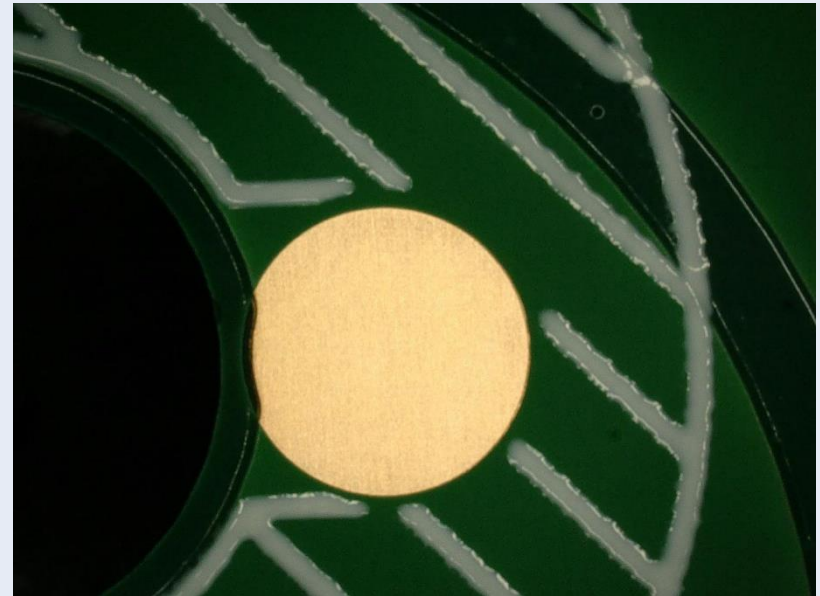
Application example: removing process residues before bonding

Gold coated bondpads before wire bonding

Before cleaning



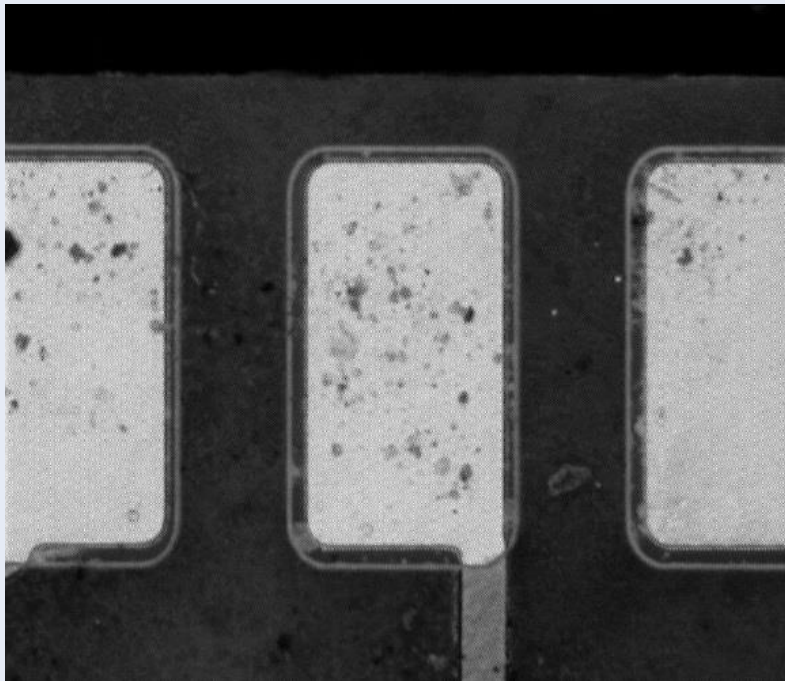
After cleaning



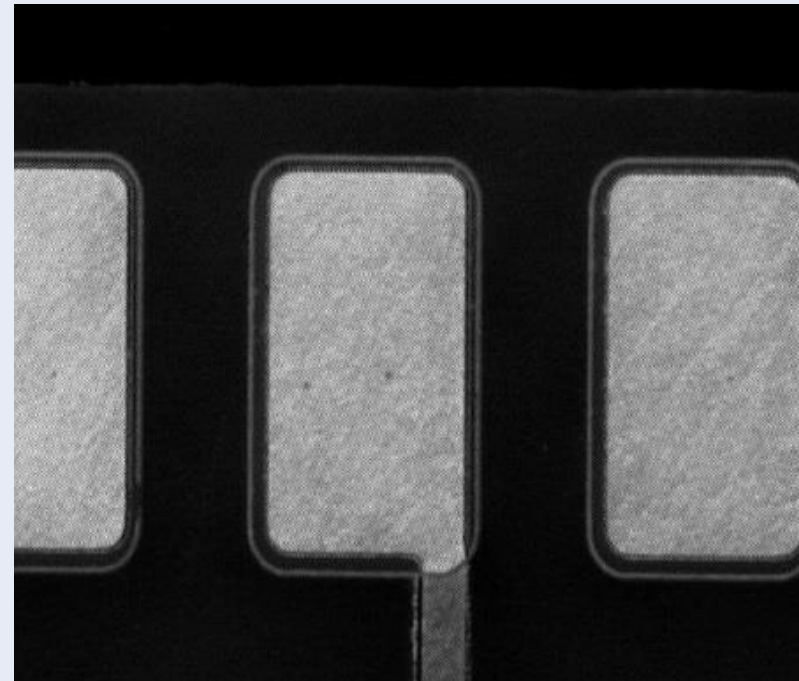
Application example: removing process residue before micro-bonding

Gold coated micro bondpads

Before cleaning



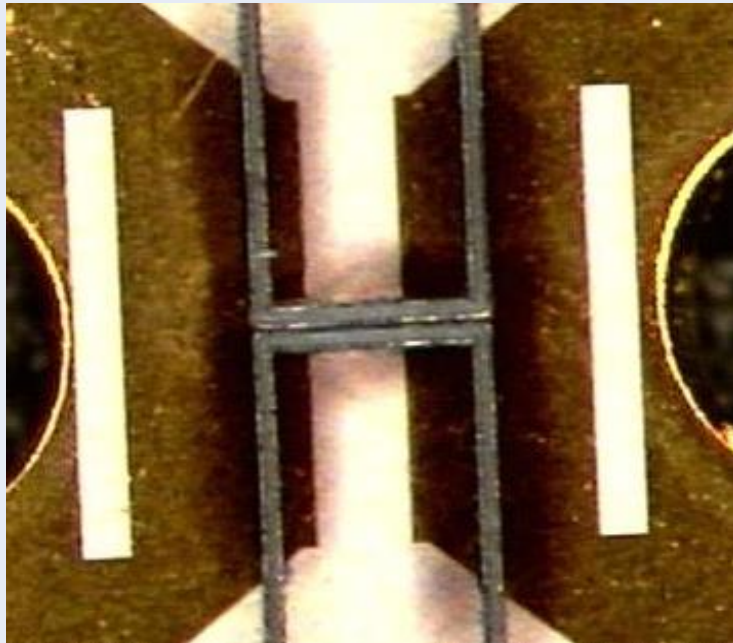
After cleaning



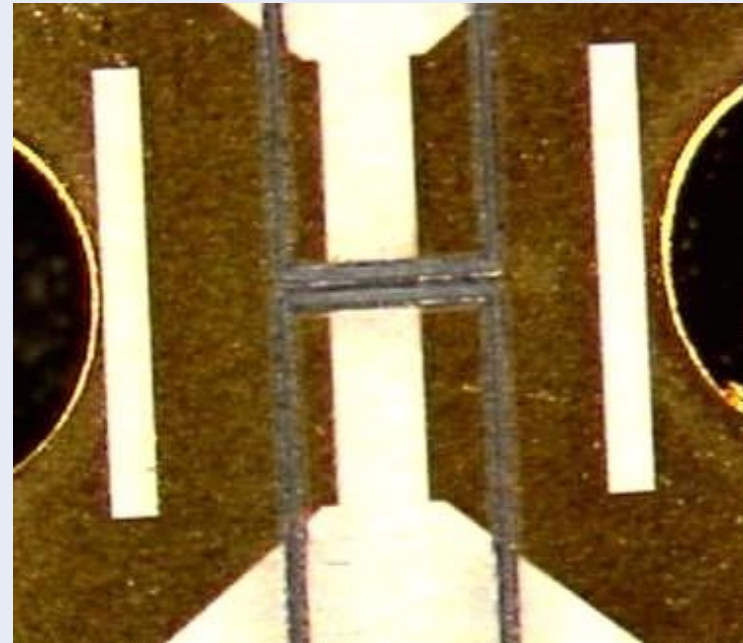
Application example: removing smoke residues after treatment with laser

Ceramic PCB with laser structure

Before cleaning



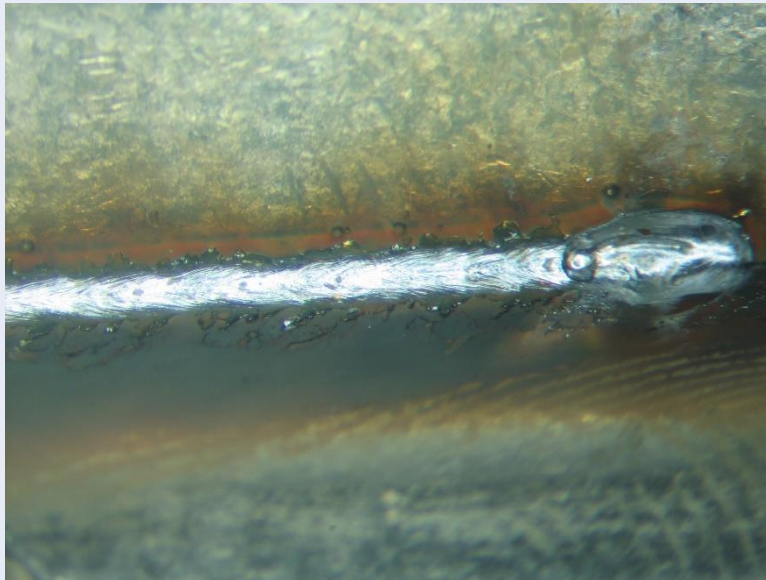
After cleaning



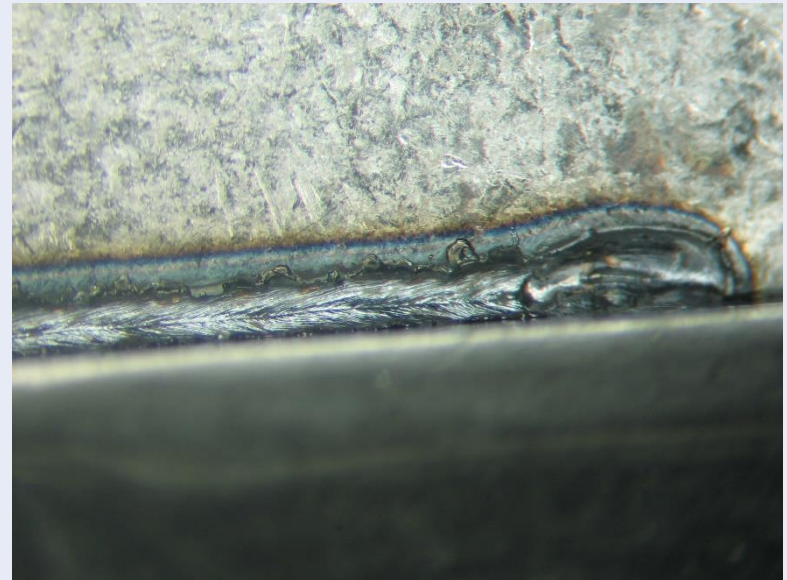
example: taking away pearls after laser welding

Beispiel: components in gear box

before



after



Automated production line, integrated cleaning

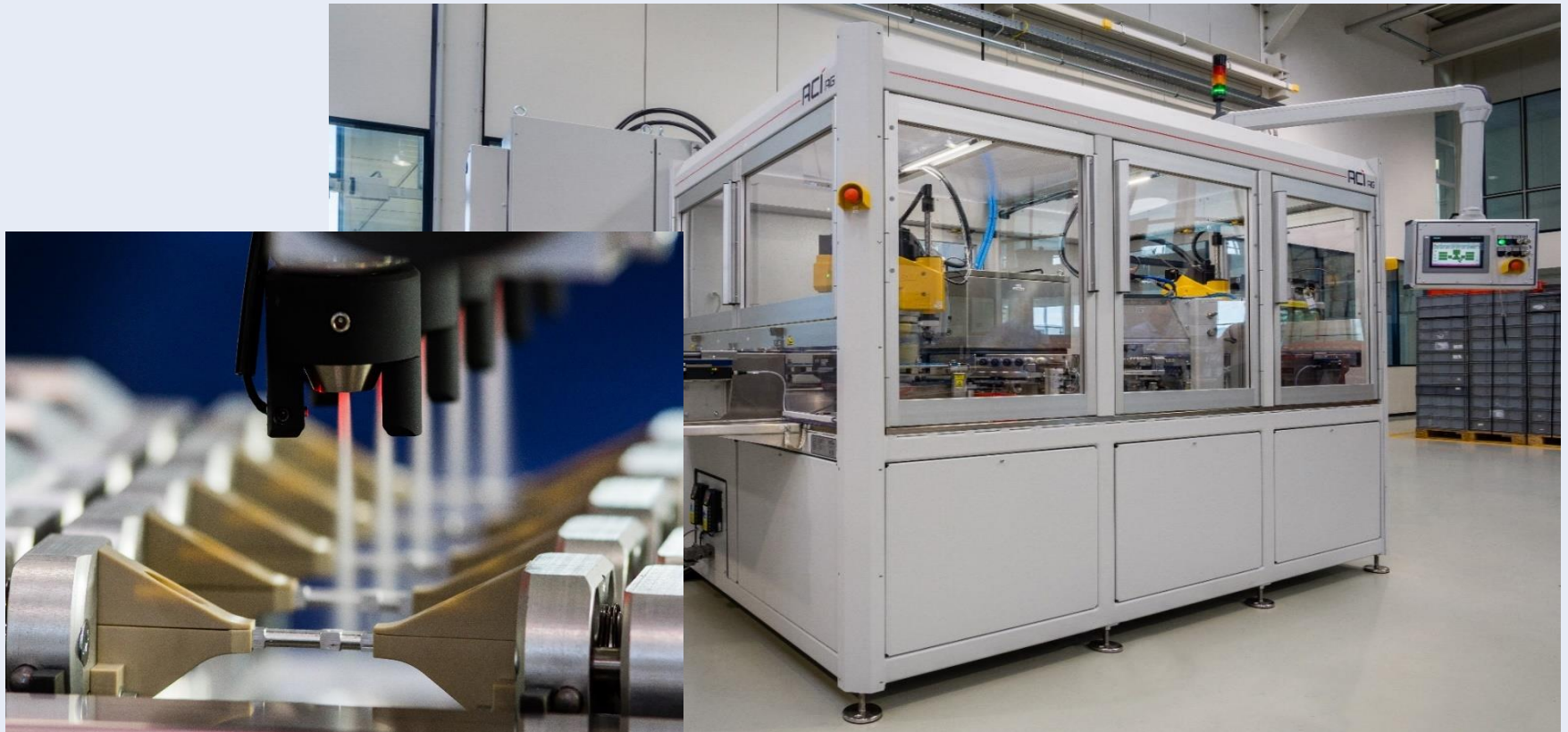
Example: Magnet valve – assembly line with cleaning station inline



quattroClean – Electronics assembly

Customized cleaning systems, example:

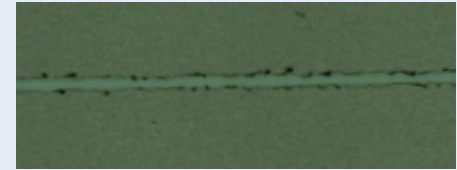
Cleaning Electro-mechanic Piezo element for fuel injection system



Automated cleaning solution – PV industry

Customized cleaning systems, example:

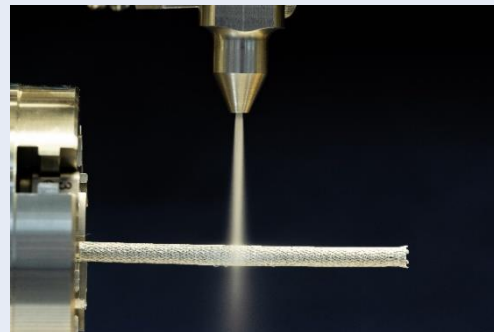
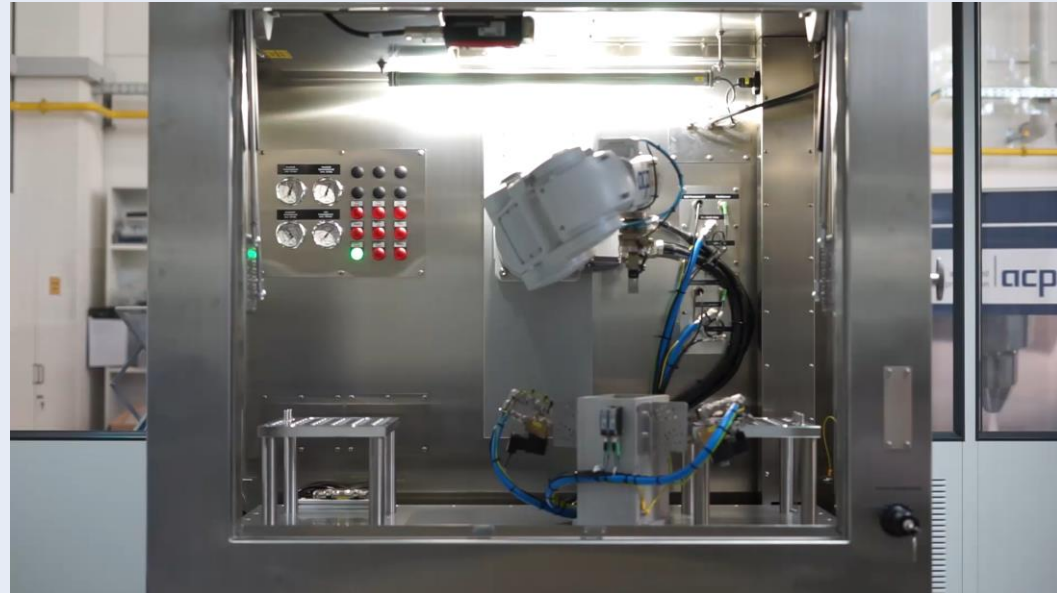
Cleaning solar panels after laser structuring – removing of flitters



Automated cleaning solution – Medical industry

Customized cleaning / micro deburring systems, example:

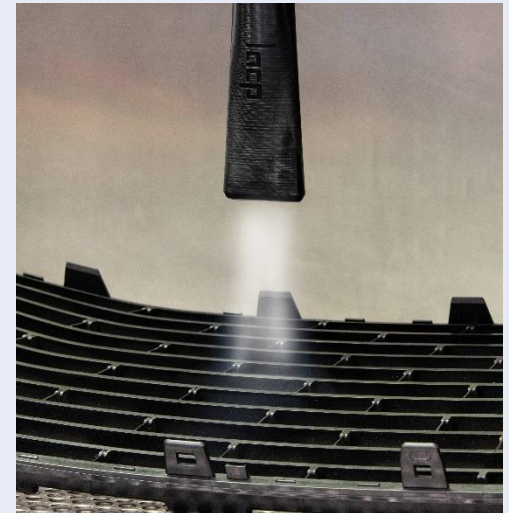
Cleaning of Stents after laser processing and etching



Second application field with examples:

1. Deburring and Cleaning: CO₂-power snow technology

- This technology works with CO₂-granules
- High power deburring and cleaning
- granules made direct from liquid CO₂
- up to automated solutions

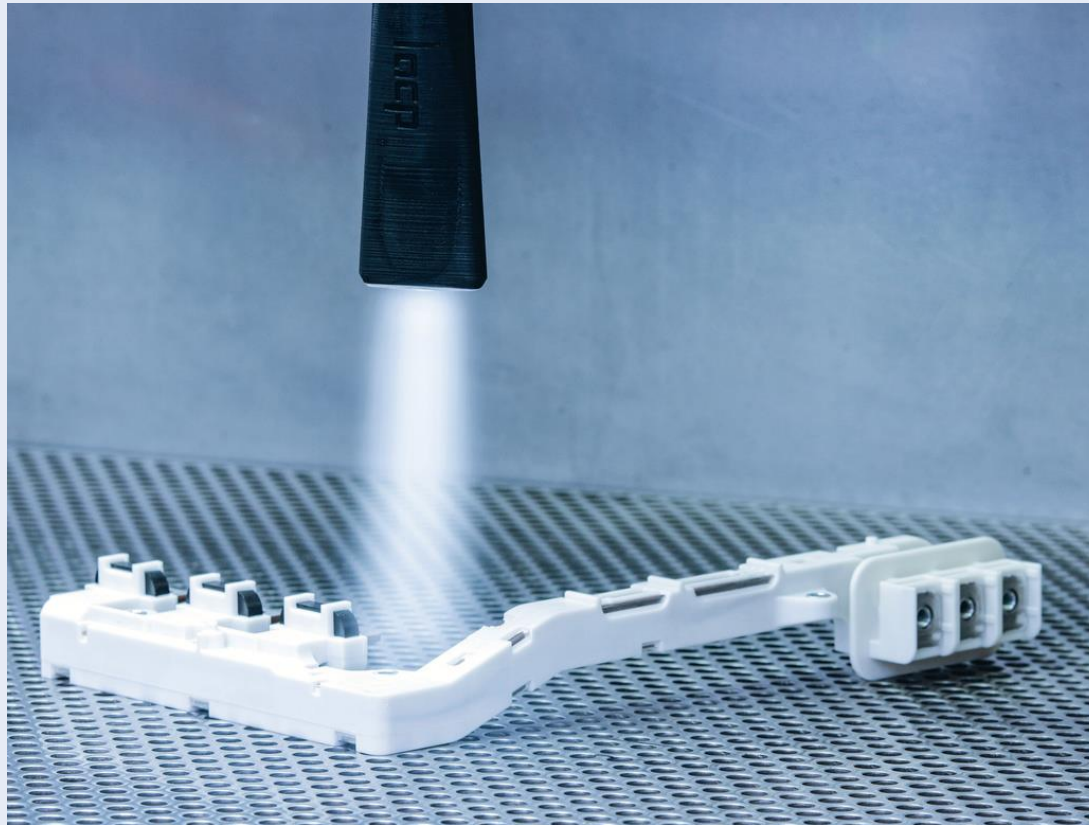


quattroClean: CO2 power snow for deburring and cleaning

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- Cleaning and removal of overmolding and plastic burrs on a plastic overmolded metal

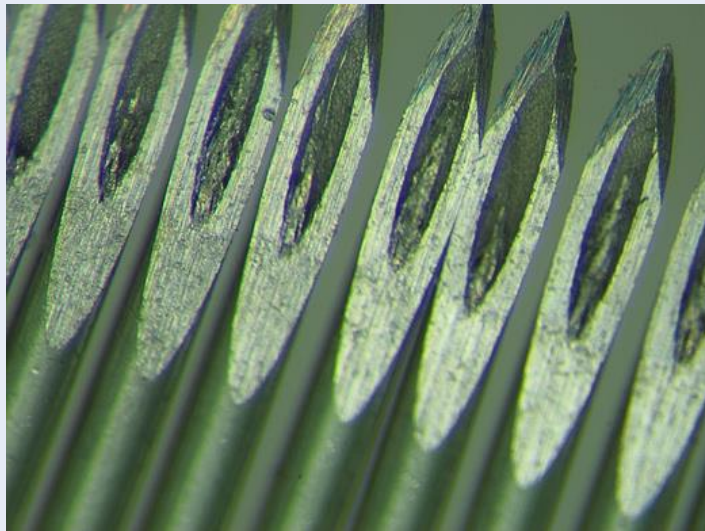


quattroClean: CO2 power snow for deburring and cleaning

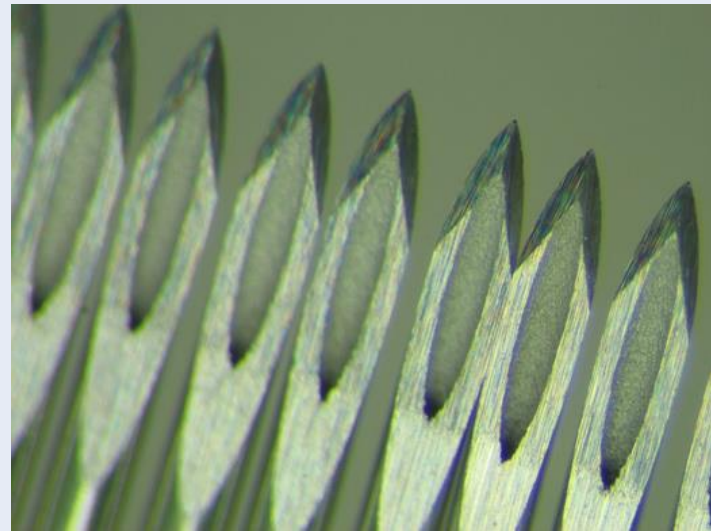
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- Deburring and cleaning in medical application



before



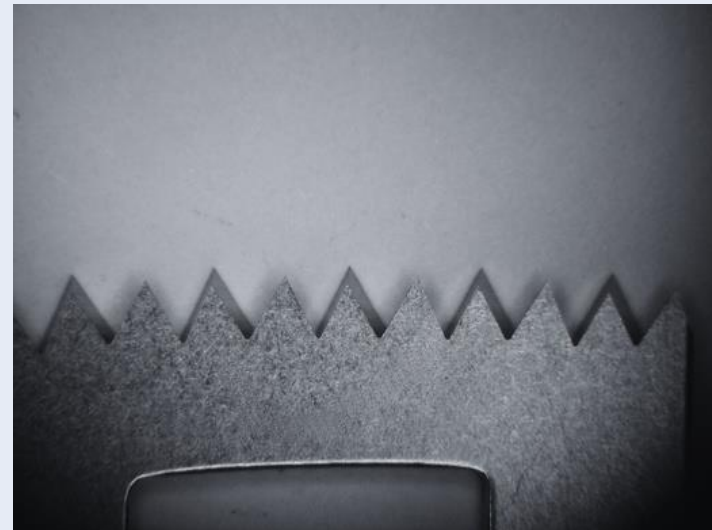
after

quattroClean: CO2 power snow for deburring and cleaning

- Deburring and cleaning in medical application



before



after

quattroClean: CO2 power snow for deburring and cleaning

- Removal of hard burrs on products, cleaning in parallel



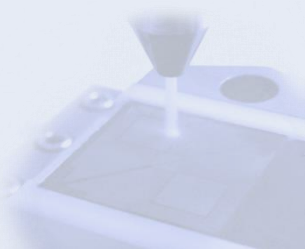
- **Summary**

Two applications fields based on liquid CO₂ and all degrees of automation are available

- 1. Micro Deburring and Cleaning: *CO₂-snow technology***
- 2. Deburring and Cleaning: *CO₂-power snow technology***

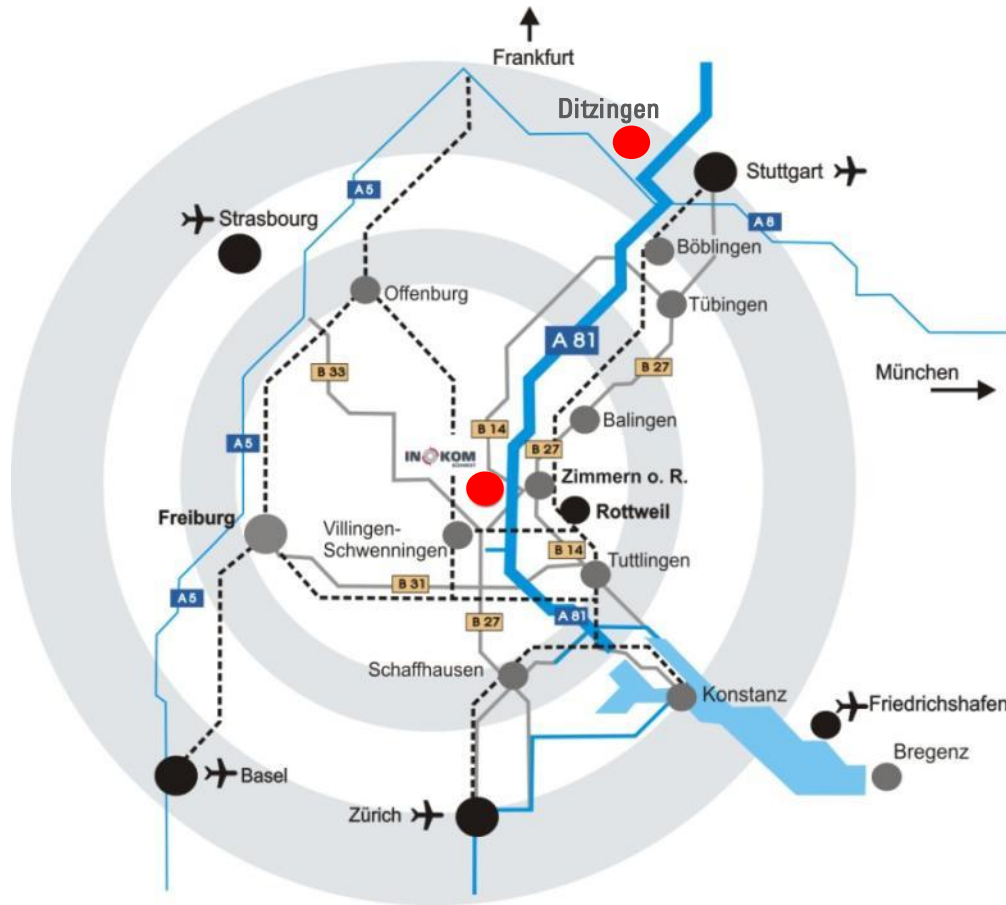
Added Values

- ✓ **Attractive ROI (compared to wet chemical cleaning)**
- ✓ **environmentally friendly due to dry, solvent-free and residue-free cleaning process**
- ✓ **Completely integrable into production line (e.g. assembly line)**
- ✓ **Reliable Process and perfectly suited to automation**
- ✓ **Minimal media consumption due to nozzle design and adjustment of parameters**
- ✓ **Low footprint, Low Installation Costs, Low Running Costs, Low Maintenance**



Contact

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